

FORM PTO-1999 (REV 11/98)		DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NO. 350013-65
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
INTERNATIONAL APPLICATION NO. PCT/IB98/00825	INTERNATIONAL FILING DATE 28 May 1998	PRIORITY DATE CLAIMED 04 June 1997	
TITLE OF INVENTION A CONTAINER CLOSURE			
APPLICANT(S) FOR DO/EO/US BAIRD-SMITH, Ian; ZIEGLER, Andreas; GEISLER, Reinhart and HAMMON, Werner			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). <input checked="" type="checkbox"/> has been transmitted by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). <ol style="list-style-type: none"> <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> have been transmitted by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input checked="" type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)) <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 			
Items 11 to 16 below concern document(s) or information included:			
<ol style="list-style-type: none"> <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input type="checkbox"/> A change of power of attorney and/or address letter. <input type="checkbox"/> Other items or information: 			

Page 1 of 2

EXPRESS MAIL MAILING LABEL

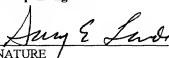
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DATE OF DEPOSIT 01 December 1999

I hereby certify that this paper or fee is being deposited with the United States Postal Service "EXPRESS MAIL POST OFFICE TO ADDRESSEE" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, Washington D.C. 20231


 PEGGY A. MOLONEY

426 Rec'd PCT/PTO 01 DEC 1999

U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/445013	INTERNATIONAL APPLICATION NO. PCT/IB98/00825	ATTORNEY'S DOCKET NUMBER 350013-65
17. <input checked="" type="checkbox"/> The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$970.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international Search Report prepared by the EPO or JPO \$840.00 International preliminary examination fee (cu CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$760.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$ 96.00		CALCULATIONS PTO USE ONLY
ENTER APPROPRIATE BASIC FEE AMOUNT =		\$840.00
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		\$130.00
CLAIMS	NUMBER FILED	NUMBER EXTRA
Total Claims	21 - 20 =	1
Independent Claims	1 - 3 =	0
MULTIPLE DEPENDENT CLAIM(S) (if applicable)		+ \$260.00
TOTAL OF ABOVE CALCULATIONS =		\$988.00
Reduction by 1/2 for filing by small entity, if applicable. A Small Entity Statement must also be filed. (NOTE: 37 CFR 1.9, 1.27, 1.28)		\$00.00
SUBTOTAL =		\$988.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).		\$00.00
TOTAL NATIONAL FEE =		\$988.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property)		\$00.00
TOTAL FEES ENCLOSED =		\$988.00
		Amount to be refunded:
		charged
<p>a. <input checked="" type="checkbox"/> A check in the amount of \$988.00 cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. 16-2230 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 16-2230. A duplicate copy of this sheet is enclosed.</p> <p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p>		
SEND ALL CORRESPONDENCE TO:		SIGNATURE
Gary E. Lande Oppenheimer Wolff & Donnelly LLP 2029 Century Park East Suite 3800 Los Angeles, CA 90067-3024		 Gary E. Lande NAME
		22, 222 REGISTRATION NUMBER

09/445043

PATENT
Docket No. 350013-65

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In The United States Patent And Trademark Office

In Re Application Of:

Ian BAIRD-SMITH, et al.

Int'l Appln. No. PCT/IB98/00825

Int'l Filing Date: 28 May 1998

U.S. Serial No. Unassigned

U.S. Filing Date: Unassigned

Entitled: **A CONTAINER CLOSURE**

Group Art Unit: Unassigned

Examiner: Unassigned

Assistant Commissioner of Patents
Washington, D.C. 20231

FIRST PRELIMINARY AMENDMENT

Sir:

Prior to examination, please amend the above-identified application as follows:

In the Claims

Claim 4, line 1, delete "any preceding" and after "claim" insert - - 1 - -.

Claim 5, lines 1 and 2, delete "or any claim dependent therefrom,".

Claim 7, line 1, delete "Claim 5 or".

Claim 8, line 1, delete "any preceding" and after "claim" insert - - 1 - -.

Claim 9, line 1, delete "any preceding" and after "claim" insert - - 1 - -.

Claim 10, line 1, delete "Claims" and substitute therefor

-- Claim -- and delete "to 9".

Claim 11, line 1, delete "any preceding" and after "claim" insert - - 1 - -.

Claim 12, line 1, delete "any preceding" and after "claim" insert - - 1 - -.

Claim 17, line 1, delete "Claim 14 or".

Claim 19, line 4, delete "Claims" and substitute therefor

- - Claim - - and delete "to 13".

Claim 20, line 3, delete "Claims" and substitute therefor

- - Claim - - and delete "to 13".

Claim 21, line 1, delete "or Claim 20".

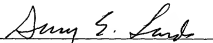
REMARKS

The purpose of this Preliminary Amendment is to eliminate multiple dependent claims. It is respectfully requested that the Examiner consider this Preliminary Amendment prior to examination and an early examination is requested.

If any additional fees are due with this submission, the Commissioner is authorized to charge them to Deposit Account Number 16-2230.

Respectfully submitted,

Dated: December 1, 1999


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A CONTAINER ASSEMBLY

This invention relates to container assemblies in particular the invention concerns such assemblies including closures known as "easy open ends".

5

Easy open ends are typically provided in containers that are elongate and, in the unfilled state, open at at least one end. An example of such a container is a metal can.

- 10 There are two main types of easy open end. One is made from relatively thick and rigid steel or aluminium, which incorporates a "score" or weakened annular region. This weakened region allows the centre part of the end to be removed, but has the disadvantages that the required opening force is relatively high, making it difficult for less dextrous people to
- 15 open, and that the ruptured edge is sharp and may cause laceration injuries. The process to form the rivet by which an opening tab may be attached requires many drawing and forming steps. Typically the thickness of steel easy open ends is 0.22 mm or greater, even up to 0.30mm, depending on the diameter of the closure.

20

An alternative easy open end typically comprises a flexible, frangible membrane usually of metal foil, or of a laminated material including a layer of metal foil, secured over the open end of a can after filling thereof with eg. a food product. Since the flexible membrane is easily peeled off

25 the can end, it is easy for a user of the can to tear the membrane to gain access to the food product inside the can. The flexible membrane is then usually torn off the can and discarded. Some types of flexible membrane include pull tabs and weakened lines to assist the opening process.

- Where a flexible membrane is used there are a number of ways to secure it to the can body. It may be sealed to a ring of aluminium or tinplate or electrolytically chromium coated steel (ECCS), which has been coated with either a layer of flexible polymer such as polypropylene or
- 5 with a layer of a lacquer which incorporates a quantity of fusible polymer such as polypropylene. To effect a seal the foil membrane (also coated with a layer of fusible polypropylene) is placed over the ring and heat is applied through tools above and below the membrane-ring components. This heat melts one or both of the polymer layers which are then sealed
- 10 together on cooling. The ring is then attached to the can body by a conventional double seam. In this component the opening is achieved by either breaking the polymer layer to metal adhesion or by breaking within the polymer layer.
- 15 An alternative method is to seal the flexible foil membrane directly to the can body, by again heating the membrane and can body until the polymer layers soften sufficiently to melt together and cool to form a homogeneous solid layer, which can then operate as above when opened. It is also possible (but not common) to use an adhesive material to fix the foil on to
- 20 the can.

Many food products are packed in cans in an uncooked or partially cooked state. On sealing of the cans in food production factories their contents are heated (eg. by steam or steam/air heating) to cook the completely and

25 simultaneously sterilise the interiors of the cans. This process, which has been in widespread use for more than 150 years, allows the safe canning of food products at very high rates of production. However, it has been traditional to employ three piece cans for this process. Both ends of a filled three piece can are substantially rigid. Hence it is necessary to use

a can opening machine to open such a can. This is generally considerably slower than opening an easy open end. Also, many people find can opening machines difficult or impossible to use.

- 5 It is possible, and indeed is common, to use easy open ends for continuous mass production of canned food products, but these ends are of the more rigid type with relatively high thickness, as described above. What is not currently possible is to use foil sealed cans in a continuous steriliser, without the use of over-pressure to counterbalance the pressure generated
10 inside the can.

- It has not previously been possible to employ the flexible membrane-type easy open ends in the continuous mass production of cans the contents of which require cooking *in situ*. This is primarily because the heating
15 process causes expansion of gases sealed within the cans, and causes further gases to evaporate from the food products, with the result that the seals between the flexible membranes and the can ends burst or, less desirably, leak in a manner that is difficult to detect. Failures of the flexible membranes themselves (as contrasted with the seals) also occur.

- 20 One possible solution to these problems lies in the use of an overpressure cooker that is capable of equalising the pressures acting on both sides of the - flexible - membranes during cooking. This apparatus is disadvantageous, however, since its heating chamber must be sealed and
25 pressurised during the cooking process. Thus the overpressure cooker cannot be used for continuous mass production employing moving conveyor lines.

Thus there is a need for an easy open closure suitable for use in continuous mass production of food products.

US Patent No. 4,683,016 discloses an easy open end the rigid closure of
5 which includes concentric, downwardly depending annular members that
tension the flexible membrane. However, this arrangement only serves to
promote a good seal between the container end and the flexible membrane
before final curing of the adhesive therebetween. This results in a smooth
and well sealed membrane, but would be unlikely to prevent bursting of
10 the seal during cooking since by that stage the strength of the seal depends
entirely on the properties of the adhesive material securing the flexible
membrane on the container end.

According to a first aspect of the invention there is provided a container
15 assembly comprising an open-ended container and a closure system
therefor, including:-

- (i) a flexible membrane closing the open end of the container;
- (ii) a seal between the flexible membrane and the container; and
- (iii) a rigid closure mounted on the container having a resiliently
20 deformable member juxtaposed to the flexible membrane, the resiliently
deformable member pressing the flexible membrane against the container
in the vicinity of the seal, thereby reinforcing the seal sufficiently to
withstand pressures generated on heating of the contents of the container.

25 This assembly is advantageous because the resiliently deformable member
(reacting against the rigid closure) continuously and evenly reinforces the
seal while the rigid closure is mounted on the container. Furthermore,
through judicious choice of the material of the resiliently deformable
member, the reinforcing pressure applied to the seal may be arranged to

increase as the pressure inside the can increases, since this increases the force conferred by the flexible membrane on the resiliently deformable material. This is ideally suited to *in situ* cooking of the can contents, since the pressure within the can progressively increases for part of the cooking process.

Preferably a container assembly in accordance with the invention includes a container which is a metal, plastic or composite can.

This can advantageously allows the mass production of canned food products that are accessible via easy open ends.

According to a second aspect of the invention, there is provided a method of forming a container assembly in accordance with the invention, comprising the steps of:

(i) securing a flexible membrane on the open end of the container by use of adhesives or heat-sealing, thereby forming a seal;

(ii) engaging the cam and follower of a rigid closure and the container with one another; and

(iii) moving the rigid closure and the container relative to one another to cause relative movement between the cam and follower in the predetermined direction, thereby causing the resiliently deformable member to press the flexible membrane against the container in the vicinity of the seal sufficiently to maintain the seal against pressures generated in the container on heating of its contents.

This method is conveniently suited to the mass production of canned food stuffs in existing food factories. The method obviates the need to use pressure cookers to cook food products in cans having easy open ends,

and allows production of the filled, sealed cans to occur while the cans move along the conveyor lines of a continuous production apparatus.

According to a third aspect of the invention, there is provided a method of
5 packaging a food product, comprising the steps of placing the food
product in an open ended container; closing the open end of the container
with a closure to provide an assembly in accordance with the invention
and heating the container assembly and the food product therein, the
10 container closure system; maintaining the seal between the flexible
membrane and the container during such heating.

According to a fourth aspect of the invention, there is provided a method
of packaging a food product comprising the steps of closing an open end
15 of a container having two open ends with a closure to provide a container
assembly in accordance with the invention placing a food product in the
container; closing the other open end of the container by flanging a
container end thereto; and heating the container and the food product
therein, the container closure system maintaining the seal between the
20 flexible membrane and the container during such heating.

Further, advantageous features of the invention are defined in the
dependent claims hereof.

There now follows a description of preferred embodiments of the
25 invention, by way of example, with reference being made to the
accompanying drawings in which:

Figure 1 is a vertically sectioned view of the end of a container
assembly comprising a container and closure according to the invention;

Figure 2 is a partly-sectioned view showing the components of the

Figure 1 container-assembly;

Figure 3 shows a step in a preferred method of forming the container assembly; and

Figure 4 shows an alternative form of container assembly according to the invention.

Referring to the drawings, there is shown an open ended container in the form of cylindrical metal can 10.

10 The open end of can 10 is closed by a flexible membrane 11 and a rigid cap 12, each of which is described in more detail below.

The body 13 of can 10 is manufactured in a generally conventional manner. Body 13 may be of the one-piece or two-piece types well known in the art of can making. Body 13 is a two-piece body in the embodiment shown.

A short distance from its open end, body 13 is necked inwardly at 14. Thus there is defined a parallel sided main body portion 13a of maximum diameter; and a further body portion 13b, proximate the open end of the can, of reduced diameter.

The necking (at 14) of the body 13 is defined by an inclined shoulder or chamfer extending about the periphery of can 13. Reduced diameter body portion 13b is substantially parallel sided and terminates in a further neck 16 defining a yet further reduced diameter portion 17.

Reduced diameter portion 17 is also substantially parallel sided, and terminates in an outwardly turned, annular flange 18 the outer diameter of which is substantially the same as that of body portion 13b.

- 5 The cylindrical walls of the body portion portions 13a, 13b and 17 are substantially parallel to the longitudinal axis of the can 10.

The annular surface of flange 18 remote from body portion 17 faces outwardly at the open end of the can, and is substantially perpendicular to
10 the longitudinal axis of the can. Flexible membrane 11 is adhesively secured to flange 18 by means of eg. an annular strip of heat seal material that cures on heating (typically up to 180°C for 1 second) thereof. The heat sealing tools 150,151 are shown in Figure 3. The step of securing the flexible membrane to the open end of the container neck may utilize a
15 heat-sealing method such as heat contact, ultra sonic, induction or hot air.

The radial dimension x of the flange 18 is, typically, 2 to 4mm in length. The width of the annular band of adhesive material between membrane 11 and flange 18 is of a similar dimension.

20

In practice the heat seal lacquer material extends over the entire interior surface of the can, as shown at 160 in Figure 3. The lacquer may be eg. a polypropylene or polyethylene extrusion coating, or could be a PET film.

- 25 The membrane 11 may be eg. a metal (eg. aluminum or steel) foil, or a laminated, flexible, composite material such as a layer of metal foil bonded to a layer of paper or a plastic film with a functional barrier layer. In any event, the lower surface 11 a of flexible member 11 is substantially inert, in the sense that it does not contaminate or react with the contents of

container 10. The upper surface 11b of flexible membrane 11 may be printed with advertising material or user instructions.

Body portion 13b has disposed at intervals about its outer periphery a series of cam members in the form of threads 19. Each thread in the embodiment shown lies at the same angle as the adjacent threads, and extends over the same length. In preferred embodiments this length is a few degrees (e.g. $5 - 10^\circ$) of arc. As illustrated schematically in Figure 1, each thread 19 is formed as an embossment that is slightly proud of the surface of body portion 13b. The embossments may be formed in a conventional manner eg. by means of an expanding, rotatable tool insertable through the open neck of can 10 during manufacture thereof, to deform the material of wall portion 13b as desired.

The closure of the open end of can 10 includes a rigid cap 12 comprising a circular disc 21 having a cylindrical, annular skirt 22 depending downwardly therefrom.

Annular skirt 22 includes on its outer surface a series of recesses of substantially the same size, angle and length as the threads 19 formed on body portion 13. The recesses 23 appear as embossments on the inner surface of skirt 22. Hence they constitute cam followers in the form of threads complementary to the threads 19. Thus the cap 12, which may be manufactured eg. by deep drawing of a slug of metal using a *per se* known process, may be screwed onto the end of can 10 through cooperation of the threads 19 and recesses 23.

When cap 12 is screwed onto the open end of can 10 as aforesaid, the angles of the threads relative to the can 10 cause disc 21 to be driven towards membrane 11 on tightening of cap 12.

- 5 The underside of disc 21 has adjacent its outermost circumference an annular member 24 secured thereto so as to depend downwardly from the underside of disc 21.

10 Annular member 24 is formed of a resiliently deformable material, such as an expanded foam, a rubber based formulation, a PVC plastisol or a similar material. It is secured to the underside of disc 21 by virtue of its formation there (eg. by moulding or injection) or, possibly, by adhesive fixing in the cap 12 of a pre-formed sealing ring 24.

- 15 As cap 12 is tightened onto can 10, annular member 24 engages membrane 11.

Annular member 24 is located and dimensioned to sandwich a portion of membrane 11 against flange 18, in the vicinity of the adhesive material
20 between membrane 11 and flange 18. Thus on tightening of cap 12, resilient, annular member 24 presses membrane 11 into tight, sealing contact with flange 18. This seal is capable of withstanding pressures developed within the can 10 during cooking of food products therein.

- 25 Furthermore, cooking of food products in the can 10 preferably occurs with the cap 12 in the position shown in Figure 1. In this position, the annular member 24 continues to press down on the seal between membrane 11 and flange 18, thereby providing additional reinforcing of the seal.

In the position shown in Figure 1, the gap 25 between membrane 11 and disc 21 is of the order of 1 - 6 mm. Thus the stretching of membrane 11 that occurs during cooking of food products in can 10 is accommodated by expansion of membrane 11 towards disc 21 that is, as indicated, rigid. Thus the gas pressure within the can is reduced compared with that encountered in conventional cans.

A preferred method of packing a food product in accordance with the invention includes placing food products in an open ended can 10 one end 27 of which is sealed (by virtue of manufacture of the can body as a two-piece body sealed at one end) by a closure to provide a container assembly according to the invention. If appropriate, a suitable modified atmosphere may be added above the level of the food product in the can 10 by a conventional apparatus; and then a conventional can end may be secured in a *per se* known manner by a "flanger", ie a double seaming machine.

Before cooking of the food products, and preferably before the food products are placed in the can, a cap 12 is screwed onto the threads 19 of 30 the closure of the invention again by machine or by hand as appropriate and tightened down onto the end of can 10 until annular member 24 presses membrane 11 against flange 18 with a predetermined pressure. The moment prior to contact between the components is shown in Figure 3. The predetermined pressure may be achieved eg. by sensing the torque necessary to rotate cap 12 onto the threads 19.

Thereafter, the can 10 is passed to a suitable cooking apparatus such as a steam, steam/air or water cascade cooker that cooks the food products within the can 10. As is well known, this process kills bacteria in the can rendering the food products safe for long term storage. It also

- 5 temporarily increases gas pressure in the can, primarily by virtue of expansion of any gas between the food material and the can body; and also through migration of gas molecules from the food products as the food product temperature increases.

- 10 The action of annular member 24 ensures that the peripheral seal of membrane 11 is strong enough to withstand the additional pressures generated during cooking. The presence of disc 21 prevents rupture of membrane 11 at locations spaced from flange 18.

- 15 In some embodiments the heating process may cause the material of member 24 to change, thereby allowing easy removal of cap 12.

- After cooling of the can 10 it may be distributed. A user of the can may then unscrew cap 12 to reveal the membrane 11. Membrane 11 may then
20 be peeled off in order to gain access to the food product within the can.

- After peeling membrane 11 may be removed and discarded. Subsequent reclosing of can 10 using cap 12 causes the annular member 24 to engage either flange 18 or an annular portion of membrane 11 remaining adhered
25 thereto, to provide a short to medium term resealing facility thereby extending the life of the food products after opening of the can. Figure 2 shows an optional pull-off tab 26, formed integrally with membrane 11, that may be provided to assist the opening of the membrane 11. Since the

hinge securing the tab 26 is of the same material and thickness as membrane 11, lifting of tab 26 is facilitated.

Thus the invention advantageously provides an apparatus and a method by means of which cooked food products may be provided in metal or other cans having easy open ends.

Furthermore, the process readily lends itself to automation using high speed can making machinery capable of forming cans at rates of perhaps 300 per minute or greater. The quality and integrity of the heat sealing operation can readily be tested and verified.

The neck 14 in the can body 13 provides a neat appearance to the can when cap 12 is secured thereto, since the skirt 22 depending downwardly from disc 21 is of the same diameter as body portion 13a. The neck 14 therefore provides for a generally flush appearance to the can end.

Alternatively the cap diameter can be made the same as the seam diameter on the opposing end of the can, so that the can will roll satisfactorily during existing processes. This is shown schematically at 130 in Figure 4.

Figure 4 also shows use of an optional, rippled form 121 of the upper wall of cap 12. This assists in resisting the cooking pressure in a *per se* known manner.

Figure 3 shows the membrane 11 in its preferred form, ie. an upper, metal foil layer 11b having its lower surface coated with eg. polypropylene 11a.

CLAIMS

1. A container assembly comprising an open-ended container and a closure system therefor including:

- 5 (i) flexible membrane closing the open end of the container;
(ii) a seal between the flexible membrane and the container; and
(iii) a rigid closure mounted on the container having a resiliently deformable member juxtaposed to the flexible membrane, the resiliently deformable member pressing the flexible membrane against the container
10 in the vicinity of the seal, thereby reinforcing the seal sufficiently to withstand pressures generated on heating of the contents of the container.

2. A container assembly according to Claim 1 wherein the container and the rigid closure include a respective cam and follower, relative
15 movement between the cam and follower in a predetermined direction causing the rigid closure and the container to approach one another, thereby increasing the pressure exerted by the resiliently deformable member on the flexible membrane.

20 3. A container assembly according to Claim 2 wherein the cam and follower include co-operating screw threads formed respectively on the container and the rigid closure.

4. A container assembly according to any preceding claim wherein the
25 container includes a neck having an annular flange defining the said seal, the resilient member being substantially congruent with the flange whereby the resilient member presses the flexible membrane against the flange.

5. A container assembly according to Claim 2 or any claim dependent therefrom, wherein the rigid closure includes a laminar member and an annular skirt depending downwardly therefrom, the cam or the follower being provided on an inner wall of the skirt.

5

6. A container assembly according to Claim 5 wherein the laminar member is a circular disc, the skirt depending from the outer periphery thereof.

10 7. A container assembly according to Claim 5 or Claim 6 wherein the laminar member is spaced from the flexible membrane by a distance less than the maximum possible extension of the flexible member towards the laminar member.

15 8. A container assembly according to any preceding claim wherein the resiliently deformable member comprises a foamed material secured to the rigid closure.

20 9. A container according to any preceding claim wherein the flexible membrane comprises a metal foil or a plastic film with a functional barrier layer adhesively secured on the container neck.

10. - A container assembly according to any of Claims 4 to 9 wherein the container neck is generally cylindrical.

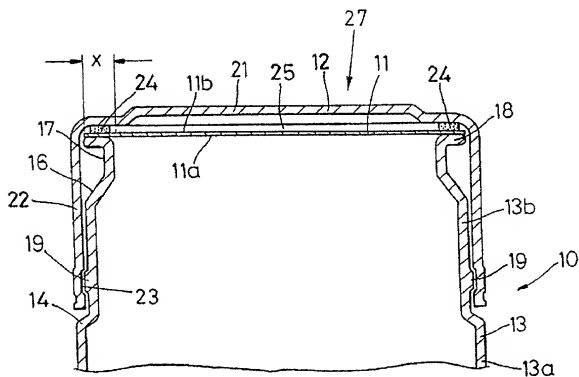
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11. A container assembly according to any preceding claim including a lifting tab hingeably secured to the flexible membrane by the same material as that of the flexible membrane.

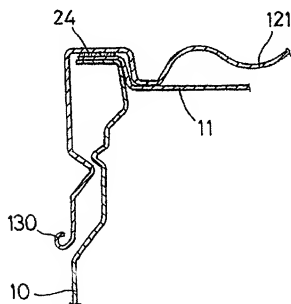
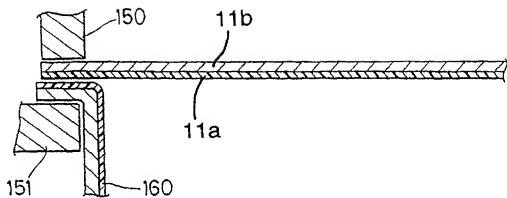
12. A container assembly according to any preceding claim in which the container is a metal, plastic or composite can.
13. A container assembly according to Claim 12 wherein the rigid cap supports of the body of the can in a radial direction.
14. A method of forming a container assembly according to Claim 2, comprising the steps of:
- (i) securing a flexible membrane on the open end of the container by use of adhesives or heat-sealing, thereby forming a seal;
 - (ii) engaging the cam and follower of a rigid closure and the container with one another; and
 - (iii) moving the rigid closure and the container relative to one another to cause relative movement between the cam and follower in the predetermined direction, thereby causing the resiliently deformable member to press the flexible membrane against the container in the vicinity of the seal sufficiently to maintain the seal against pressures generated in the container on heating of its contents.
15. A method according to Claim 14 wherein the container has a neck including the step of securing the said flexible membrane on the open end of the said container neck by use of a heat-sealing method such as heat contact, ultrasonic, induction or hot air heating.
16. A method according to Claim 14 wherein the step of moving the rigid closure and the container relative to one another includes rotating the rigid closure and the container relative to one another.

17. A method according to Claim 14 or Claim 16 wherein the container has a neck and wherein the step of adhesively securing the flexible membrane on the open end of the container includes the sub steps of applying adhesive material to the flexible membrane and/or the container neck; engaging the flexible membrane and the container neck with one another to define the seal; and curing the adhesive material.
18. A method according to Claim 17 wherein the substep of curing the adhesive material includes heating thereof.
19. A method of packaging a food product, comprising the steps of placing the food product in an open ended container; closing the open end of the container with a container closure to provide a container assembly according to any of Claims 1 to 13; and heating the container assembly and the food product therein, the container closure system maintaining the seal between the flexible membrane and the container during such heating.
20. A method of packaging a food product comprising the steps of closing an open end of a container having two open ends with a closure to provide a container assembly according to any of Claims 1 to 13; placing a food product in the container; closing the other open end of the container by flanging a container end thereto; and heating the container and the food product therein, the container closure system maintaining the seal between the flexible membrane and the container during such heating.
21. A method according to Claim 19 or Claim 20 wherein the step of heating includes cooking the food product in the container.

1/3

*Fig. 1*

3/3



**DECLARATION, POWER OF ATTORNEY AND PETITION
(WITH AUTHORIZATION RE AGENT)**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled A CONTAINER CLOSURE, the specification of which was filed on December 1, 1999 as Application Serial No. 09/445,043.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 C.F.R. § 1.56(a).

I hereby claim foreign priority benefits under 35 U.S.C. § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application of which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

Number	Country	Filing Date	Priority Claimed?
NONE			

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose material information as defined in 37 C.F.R. § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status
NONE		

I hereby declare: All statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. These statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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as my attorneys with full power of substitution and revocation, to prosecute said application and to transact in connection therewith all business in the Patent and Trademark Office and before competent International Authorities.

I further authorize and empower my U.S. attorneys, OPPENHEIMER WOLFF & DONNELLY LLP, to receive and act upon all instructions provided to them by my the following agents: Eric Potter Clarkson with respect to all matters relating to the filing, prosecution, abandonment, or issuance of the above-described U.S. patent application including all divisional, continuing, or other related applications. OPPENHEIMER WOLFF & DONNELLY LLP may continue to follow all instructions received from the agents until notified in writing to the contrary.

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition.

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